REMARKS

Claims 59-62, 65, 67-74, 81-84, 86, and 89-101 presently appear in this case. No claims have been allowed. The Official Action of June 22, 2011, has now been carefully studied. Reconsideration and allowance are hereby respectfully urged.

Briefly, the present invention relates to nanostructures having at least at least one elongated structure element of a first material, at least one end of which bears a nanozone of a second material that differs from the first in electrical conductivity, chemical reactivity or composition. In a first preferred embodiment, the nanostructure has a branched shape with at least two elongated structure elements of the first material. In a second preferred embodiment, at least one of the first and second materials is a semiconductor material and the second material is in direct contact with the first material. The invention is further directed to a method of making such nanostructures by providing a solution of nanostructures consisting of a first material, followed by contacting such nanostructures in solution with an agent of a second material, and allowing growth of the agent of second material on an end portion of the nanostructures. In another preferred embodiment, the method involves first providing an organic solution of

semiconductor nanostructures consisting of a first material. The nanostructure in the organic solution are then contacted with another organic solution comprising a metal or metal alloy source, a stabilizer and/or a surfactant and/or an electron donor, and then the metal or metal alloy is allowed to grow on an end portion of the nanostructures.

Claim 65 has been objected to because there appears to be an extra space between "nanostructure" and "according."

While applicant protests that there is no statute, regulation or practice that prevents the appearance of extra spaces in a claim, nevertheless, there is no such extra space in claim 65 as presented herein, thus rendering this objection moot.

Claims 83 and 84 have been objected to as being improper dependent claims for failing to further limit the subject matter of a previous claim.

Claim 83 has now been amended so as to depend from claim 98. Claims 83 and 84 do further limit the subject matter of claim 98. Accordingly, this objection has now been obviated. Reconsideration and withdrawal thereof is respectfully urged.

Claims 59-62, 81-84, 86 and 90 have been rejected under 35 USC 102(e) as being anticipated by Natan. The examiner states that Natan anticipates claim 59 as it

discloses nanorods having two end portions, each coupled to a corresponding nanozone of a second material. This rejection is respectfully traversed.

Natan makes its structure by electroplating metals into the pores of a filter. For example, a layer of silver may be electrodeposited onto the bottom of the pore. A layer of gold may be electrodeposited into the pore on top of the silver, and then a layer of silver electrodeposited onto of the gold within the same pore. Then the filter is dissolved, leaving only the metal rod with three segments. This is substantially different from the present method of growing the metal on the ends of preexisting nanostructures in solution. While the method claims have not been rejected as being anticipated by Natan, the difference in methods results in differences in the product. Claim 59 has now been amended so as to read only on nanostructures that cannot be made by the procedure of Natan.

Natan can only make one dimensional rods, not V-shaped bipods and not tripods, tetrapods, etc. Claim 59 has now been amended to require that the nanostructure have "a branched shape." Note the present specification at page 6, lines 21-24, where it states:

> The nanostructures used in the method of the invention have an elongated shape … in branched form. More preferably the nanostructures have an elongated shape

> such as for example … branched shape such as bipods, tripods, tetrapods and the like.

Thus, branched bipods, which are non-linear, are differentiated from nanorods, which are linear. Nanorods are one dimensional and linear, while branched bipods are non-linear and are not one dimensional, but may be, for example, in V-shape. Since the process of Natan cannot make any kind of branched structure, claim 59 and the claims dependent therefrom cannot be anticipated by Natan because they all require a branched structure. Reconsideration and withdrawal of this rejection insofar as claim 59 and those claims that are dependent therefrom are concerned are therefore respectfully urged.

New claim 92 has now been added which distinguishes from Natan in a different manner and therefore does not exclude that the nanostructure is in the shape of nanorods as in Natan. Claim 92 requires that at least one of the first and second materials be a semiconductor material and that the second material be in direct contact with the first material. Such a structure cannot be obtained by the procedure of Natan.

While Natan states that semiconductor materials can be used along with other metals, there is only one example of forming a layer of semiconductor material in the

electrodeposition process of Natan. This appears at the top of column 38, where it states:

> CdSe is currently plated via a potential sweep method from a solution of $CdSO_4$ and SeO_2. Mechanical stability problems have been encountered with the metal:CdSe interface; i.e. they break when sonicated during the process of removing them from the membrane. This has been remedied with the addition of a 1,6-hexanedithiol layer between each surface.

Thus, one of ordinary skill in the art would understand that simply layering different materials in a pore, as is done by Natan, will not provide mechanical stability once the rod is released, particularly between metals and semiconductors, because there is no chemical bond between the layers as there is when one is grown on the other by the method of the present invention. This is why Natan teaches that one needs a glue between the layers, i.e., the bifunctional 1,6-hexanedithiol layer.

Claim 92 specifies that one of the materials is a semiconductor material and the other material is in direct contact therewith. This language excludes the possibility of there being a bifunctional layer therebetween in order to cause the two materials to adhere. Accordingly, as Natan does not disclose any method of obtaining a nanorod in which one of the materials is a semiconductor and with the two materials being in direct contact with one another, claim 92 is not

anticipated and this claim and those claims dependent therefrom should also be free of the present rejection.

Claims 68-71, 73 and 74 have been rejected under 35 USC 102(b) as being anticipated by Banin. This rejection is respectfully traversed.

The process of Banin is different from that of the present invention as Banin only grows its nanorods from a seed of metal. Thus, the "nanozone" is formed first and the rods are grown from it. The metal is not elongated but it is effectively a point source.

In order to make more explicit the features that distinguish the present invention from Banin, claim 68 has now been amended to specify that the nanostructures that are present in the solution provided in the first step of claim 68, consist of a first material. Thus, one starts with nanostructures having at least one elongated structure element that are all purely a single material. In other words, they do not yet have any nanozone or second material thereon.

This distinguishes the method of the present invention from Banin as there is no point in the procedure of Banin that one obtains a solution of nanostructures that is then put into solution with an agent of the second material, such as gold. In Banin, the semiconductor precursor is added to a solution of gold so that the semiconductor nanorod grows

on the gold seeds. At no point in the process of Banin does there exist pure nanostructures consisting of a first material, which nanostructures have at least one elongated structure element present, in solution.

The examiner refers to paragraph (a) on page 8 of the Banin reference. However, in this solution there never exists elongated structure elements consisting only of one material. The only elongated nanostructures that can exist in the solution of the Banin reference at any point in time are ones having metal on one end. Accordingly, this amendment to claim 68 obviates the anticipation rejection. Reconsideration and withdrawal of this rejection are therefore respectfully urged.

Claims 65, 67, 89, and 91, have been rejected under 35 USC 103(a) as being unpatentable over Natan in view of Majumdar. The examiner states that the semiconductor materials of Majumdar could be used as the semiconductor materials of Natan. This rejection is respectfully traversed.

The Majumdar reference does not satisfy any of the deficiencies of Natan as discussed above with respect to the anticipation rejection. No combination of Natan with Majumdar would make obvious the branched nanostructures of claim 59, or the direct contact of the seminconductor material with the second material in the nanostructures of claim 92.

Accordingly, reconsideration and withdrawal of this rejection are respectfully urged.

It is submitted that all of the claims now present in the case clearly define over the references of record and fully comply with 35 USC 112. Reconsideration and allowance are therefore earnestly solicited.

Respectfully submitted,

BROWDY AND NEIMARK, P.L.L.C.
Attorneys for Applicant(s)

By /rlb/
Roger L. Browdy
Registration No. 25,618

RLB:jhw
Telephone No.: (202) 628-5197
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